

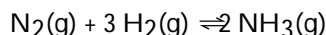
Name \_\_\_\_\_

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

- 1) Give the direction of the reaction, if  $K \ll 1$ . 1) \_\_\_\_\_
- A) If the temperature is raised, then the forward reaction is favored.  
B) The forward reaction is favored.  
C) If the temperature is raised, then the reverse reaction is favored.  
D) The reverse reaction is favored.  
E) Neither direction is favored.

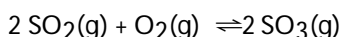
- 2) Give the direction of the reaction, if  $K = 1$ . 2) \_\_\_\_\_
- A) If the temperature is raised, then the forward reaction is favored.  
B) If the temperature is raised, then the reverse reaction is favored.  
C) The reverse reaction is favored.  
D) The forward reaction is favored.  
E) Neither direction is favored.

- 3) Determine the value of  $K_c$  for the following reaction if the equilibrium concentrations are as follows:  $[N_2]_{eq} = 1.5 \text{ M}$ ,  $[H_2]_{eq} = 1.1 \text{ M}$ ,  $[NH_3]_{eq} = 0.47 \text{ M}$ . 3) \_\_\_\_\_



- A) 0.11                      B) 3.5                      C) 0.78                      D) 0.28                      E) 9.1

- 4) Consider the following reaction, equilibrium concentrations, and equilibrium constant at a particular temperature. Determine the equilibrium concentration of  $SO_3(g)$ . 4) \_\_\_\_\_



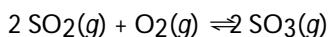
$$K_c = 1.7 \times 10^8$$

$$[SO_2]_{eq} = 0.0034 \text{ M}$$

$$[O_2]_{eq} = 0.0018 \text{ M}$$

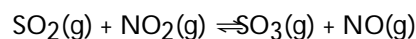
- A)  $1.0 \times 10^3 \text{ M}$   
B) 0.53 M  
C)  $9.6 \times 10^{-4} \text{ M}$   
D) 1.9 M  
E) 0.73 M

- 5) The following reaction is exothermic. Which change will shift the equilibrium to the left? 5) \_\_\_\_\_



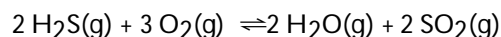
- A) decrease pressure  
B) raising the temperature  
C) increase volume  
D) all of the above  
E) none of the above

- 6) Consider the following reaction at equilibrium. What effect will removing NO<sub>2</sub> have on the system? 6) \_\_\_\_\_



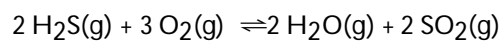
- A) No change will occur since SO<sub>3</sub> is not included in the equilibrium expression.
- B) The equilibrium constant will decrease.
- C) The reaction will shift to decrease the pressure.
- D) The reaction will shift in the direction of products.
- E) The reaction will shift in the direction of reactants.

- 7) Consider the following reaction at equilibrium. What effect will adding more H<sub>2</sub>S have on the system? 7) \_\_\_\_\_



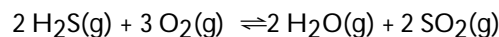
- A) The equilibrium constant will increase.
- B) The reaction will shift in the direction of products.
- C) The reaction will shift to the left.
- D) The equilibrium constant will decrease.
- E) No change will be observed.

- 8) Consider the following reaction at equilibrium. What effect will increasing the volume of the reaction mixture have on the system? 8) \_\_\_\_\_



- A) The reaction will shift to the right in the direction of products.
- B) No effect will be observed.
- C) The equilibrium constant will decrease.
- D) The equilibrium constant will increase.
- E) The reaction will shift to the left in the direction of reactants.

- 9) Consider the following reaction at equilibrium. What effect will adding 1 mole of Ar to the reaction mixture have on the system? 9) \_\_\_\_\_



- A) The reaction will shift to the right in the direction of products.
- B) The equilibrium constant will increase.
- C) The equilibrium constant will decrease.
- D) No effect will be observed.
- E) The reaction will shift to the left in the direction of reactants.

10) Consider the following reaction at equilibrium. What effect will adding some C have on the system?

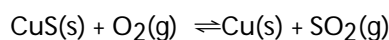
10) \_\_\_\_\_



- A) The reaction will shift to the right in the direction of products.
- B) The equilibrium constant will decrease.
- C) The equilibrium constant will increase.
- D) No effect will be observed since C is not included in the equilibrium expression.
- E) The reaction will shift to the left in the direction of reactants.

11) Consider the following reaction at equilibrium. What effect will increasing the pressure of the reaction mixture have on the system?

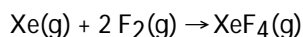
11) \_\_\_\_\_



- A) The equilibrium constant will increase.
- B) The equilibrium constant will decrease.
- C) The reaction will shift to the left in the direction of reactants.
- D) No effect will be observed.
- E) The reaction will shift to the right in the direction of products.

12) Consider the following reaction at equilibrium. What effect will reducing the pressure of the reaction mixture have on the system?

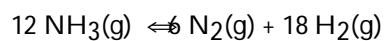
12) \_\_\_\_\_



- A) No effect will be observed.
- B) The reaction will shift to the left in the direction of reactants.
- C) The equilibrium constant will decrease.
- D) The equilibrium constant will increase.
- E) The reaction will shift to the right in the direction of products.

13) Express the equilibrium constant for the following reaction.

13) \_\_\_\_\_



A)  $K = \frac{[\text{N}_2]^6[\text{H}_2]^{18}}{[\text{NH}_3]^{12}}$

B)  $K = \frac{[\text{N}_2][\text{H}_2]^{1/3}}{[\text{NH}_3]^{1/2}}$

C)  $K = \frac{[\text{NH}_3]^{1/2}}{[\text{N}_2][\text{H}_2]^{1/3}}$

D)  $K = \frac{[\text{NH}_3]}{[\text{N}_2]^2[\text{H}_2]^3}$

E)  $K = \frac{[\text{NH}_3]^{12}}{[\text{N}_2]^6[\text{H}_2]^{18}}$

14) Express the equilibrium constant for the following reaction.

14) \_\_\_\_\_



A)  $K = \frac{[\text{PCl}_3]^4[\text{Cl}_2]^4}{[\text{PCl}_5]^4}$

B)  $K = \frac{[\text{PCl}_3]^2[\text{Cl}_2]^2}{[\text{PCl}_5]^2}$

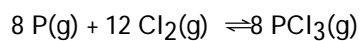
C)  $K = \frac{[\text{PCl}_5]^{1/2}}{[\text{PCl}_3]^{1/2}[\text{Cl}_2]^{1/2}}$

D)  $K = \frac{[\text{PCl}_5]^4}{[\text{PCl}_3]^4[\text{Cl}_2]^4}$

E)  $K = \frac{[\text{PCl}_3][\text{Cl}]^2}{[\text{PCl}_5]}$

15) Express the equilibrium constant for the following reaction.

15) \_\_\_\_\_



A)  $K = \frac{[\text{PCl}_3]^{1/2}}{[\text{P}]^{1/2}[\text{Cl}_2]^{1/3}}$

B)  $K = \frac{[\text{P}]^8[\text{Cl}_2]^{12}}{[\text{PCl}_3]^8}$

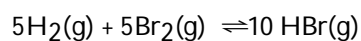
C)  $K = \frac{[\text{P}][\text{Cl}_2]^{3/2}}{[\text{PCl}_3]}$

D)  $K = \frac{[\text{PCl}_3]^8}{[\text{P}]^8[\text{Cl}_2]^{12}}$

E)  $K = \frac{[\text{PCl}_3]}{[\text{P}][\text{Cl}_2]^{3/2}}$

16) Express the equilibrium constant for the following reaction.

16) \_\_\_\_\_



A)  $K = \frac{[\text{H}_2][\text{Br}_2]}{[\text{HBr}]}$

B)  $K = \frac{[\text{HBr}]^{10}}{[\text{H}_2]^5[\text{Br}_2]^5}$

C)  $K = \frac{[\text{H}_2]^5[\text{Br}_2]^5}{[\text{HBr}]^{10}}$

D)  $K = \frac{[\text{HBr}]}{[\text{H}_2]^{1/2}[\text{Br}_2]^{1/2}}$

E)  $K = \frac{[\text{H}_2]^{1/2}[\text{Br}_2]^{1/2}}{[\text{HBr}]}$